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Memo

DATE: December 6, 2002

TO: RHIC E-Coolers

FROM: *Ady Hershcovitch*

SUBJECT: **Minutes of the December 6, 2002 Meeting**

Present: Ilan Ben-Zvi, Gregory Citver, Ady Hershcovitch, Derek Lowenstein, Thomas Roser, Triveni Srinivasan-Rao, Dejan Trbojevic, Dong Wang, Jie Wei.

Topics discussed: Electron Gun Frequency Choice, 939 Setup.

Electron Gun Frequency Choice: Ilan opened the meeting with a report of his trip to Los Alamos. Ilan was impressed that the size of the Los Alamos 700 MHz power system was smaller than he expected. The power supply can fit in about half the size of the Large Conference room in building 911B. The klystron is about 4 meters long. To Derek's comment about remembering the system to be bigger, Ilan replied that the plumbing contributes significantly to the system size. Furthermore, in answer to Derek's question on power needs, Ilan commented that we need 1 MW, while Los Alamos' system is 10 MW.

Dejan question about frequency choice of 700 MHz versus 750 MHz started a discussion regarding best frequency choice. Ilan explained the frequency constraints, which must be multiples (frequency harmonics) of the 28.15 MHz, are needed for RHIC's 360 bunches. Presently the preferred frequency for us is 703.75 MHz (25th harmonic of 28.15 MHz). In answer to Derek's question about klystron tuneability, Ilan said that CPI (the maker of the Los Alamos 700 MHz klystron) claims that the 700 MHz can be tuned to our desired 703.75 MHz. Thus, our frequency need is compatible with the Los Alamos system. However, other than frequency choice, our program overlaps with that of Jefferson lab, since we'll need to use their chemical cleaning facility and other services. But, Jefferson lab is considering 750 MHz for their FEL system. The nearest harmonic available to us is at 760.05 MHz. Discussions with Jefferson lab concerning their frequency are necessary. Since JLAB's electron gun is dc based, they are not restricted by the availability of high-power cw klystrons. To Derek's question of why shouldn't we go to a dc gun, Thomas replied that for our required brightness a dc gun is not an option.

Due to the discussion of dc versus rf electron gun, Ady asked whether any further inquiry into the merit of field emission cathodes should be dropped. In a recent development, a company called ANI is marketing field emission cathodes made of carbon nanotubes, which do not have the problems of longevity and degradation that had plagued other field emission cathodes. The advantages of these cathodes are higher currents and the ability to function

well at pressures of even 10^{-5} Torr. Ilan pointed out that these cathodes probably have higher emittance, since their current profile is comprised of many hot spots. However, the brightness, and hence, the rf electron gun requirement is paramount. In addition, the emission phase and pulse duration of field emitted electrons is not optimal.

Finally, in answer to Dejan's question about the status of the Los Alamos – AES design of their 700 MHz electron gun, Ilan's reply was that it should be completed in March 2003.

939 Setup: in answer to Thomas' question, Triveni reported on the status cathode development. The deposition chamber was delivered from Kurt Lasker and it is now being prepared to test a deposition sample. The laser, which had to be sent back to Switzerland, will be redelivered next week. Ilan reported that work needed to be performed on a milling machine at AES is presently being performed (AES debugged their new milling machine).

Ilan added that some of our near term objectives are to study outgassing rates from GlidCop and various brazings, the contaminants they generate and their effects on cathode lifetime.